NOAA's LRIT Development Status

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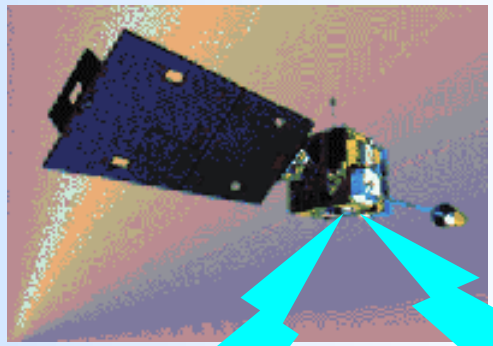
Background

- **WEFAX and LRIT are considered Low Data Rate Geostationary Meteorological Satellite Direct Broadcast Services**
- **In the 1990's the Coordination Group for Meteorological Satellites (CGMS) began developing LRIT standards per recommendation of the World Meteorological Organization (WMO)**
- **NOAA must implement LRIT on GOES-N,O,P series**
- **NOAA began implementation on GOES K,L,M series (current spacecraft) in 2003**

Low Data Rate Direct Broadcast

WEFAX and LRIT data are processed in ESPC, sent to the Wallops CDA via T1, uplinked to the GOES spacecraft, and broadcast to end users.



GOES

T1

ESPC
WEFAX/LRIT

Wallops CDA

Ground Stations/ User Terminals

LRIT – NOAA's Low Rate Information Transmission System

- S-Band broadcast of low rate digital data (128 kb/s) using CCSDS formatting, to be 24 hours a day on GOES East and West. Products include GOES, NWS Data, GMS, DCS, text messages, and more.
- New system to replace WEFAX.
- First successful End-to-End testing July 8-10 of 2003.
- Transition from WEFAX to LRIT will be performed over several years and involve time sharing of the WEFAX transponder (GOES I-M only).

LRIT CONFIGURATION ITEMS

- System comprised of several different hardware platforms:
  - – GOES Ingester : HP server/HP UNIX (AFEP)
  - – LRIT Product Processor : Dell server/LINUX
  - – CCSDS Preprocessor : IBM server/LINUX
  - – CCSDS processor : AVTEC PTP/NT (COTS)

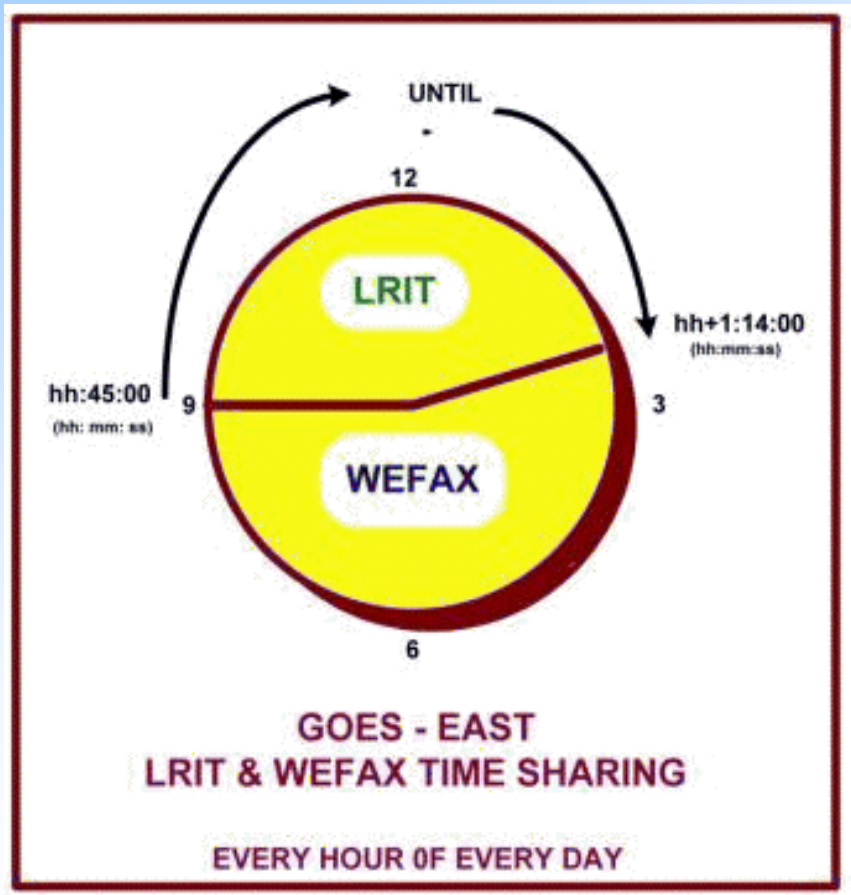
    RF Modulator : Agilent Technologies

    RF Switch : IBM Server/NT (transition only)
  - – User receive station: IBM/Win 2000

The Transition to LRIT

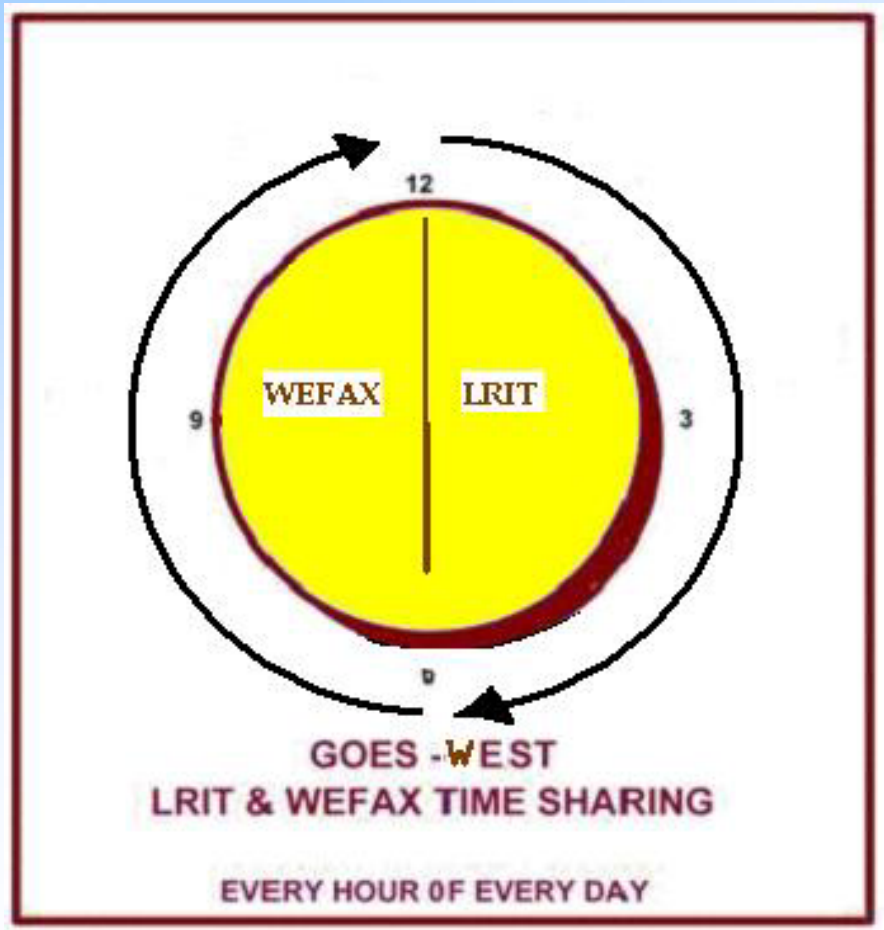
- …
  - Started in August 2003 with LRIT data being transmitted (Monday through Friday) during the WEFAX vacant times, twice daily.
    - first daily test transmission period from 16:50 to 17:06 UTC.
    - second daily test transmission period from 17:50 to 17:58 UTC.

Transition to LRIT Continues



- Alternating LRIT and WEFAX transmissions on GOES-East began in October 2003
  - **29 minutes LRIT**
  - **31 minutes WEFAX**
- Will continue to March 2005

LRIT GOES-West



- Alternating LRIT and WEFAX transmissions on GOES-West began in October 2004
  - **30 minutes LRIT**
  - **30 minutes WEFAX**
- Will continue to October 2005

SOME ADVANTAGES of LRIT

- **More data**
- **Reduced latency**
- **More diverse product suite**
- **Improved image resolution**
- **Compression for better bandwidth utilization**
- **Improved user flexibility**

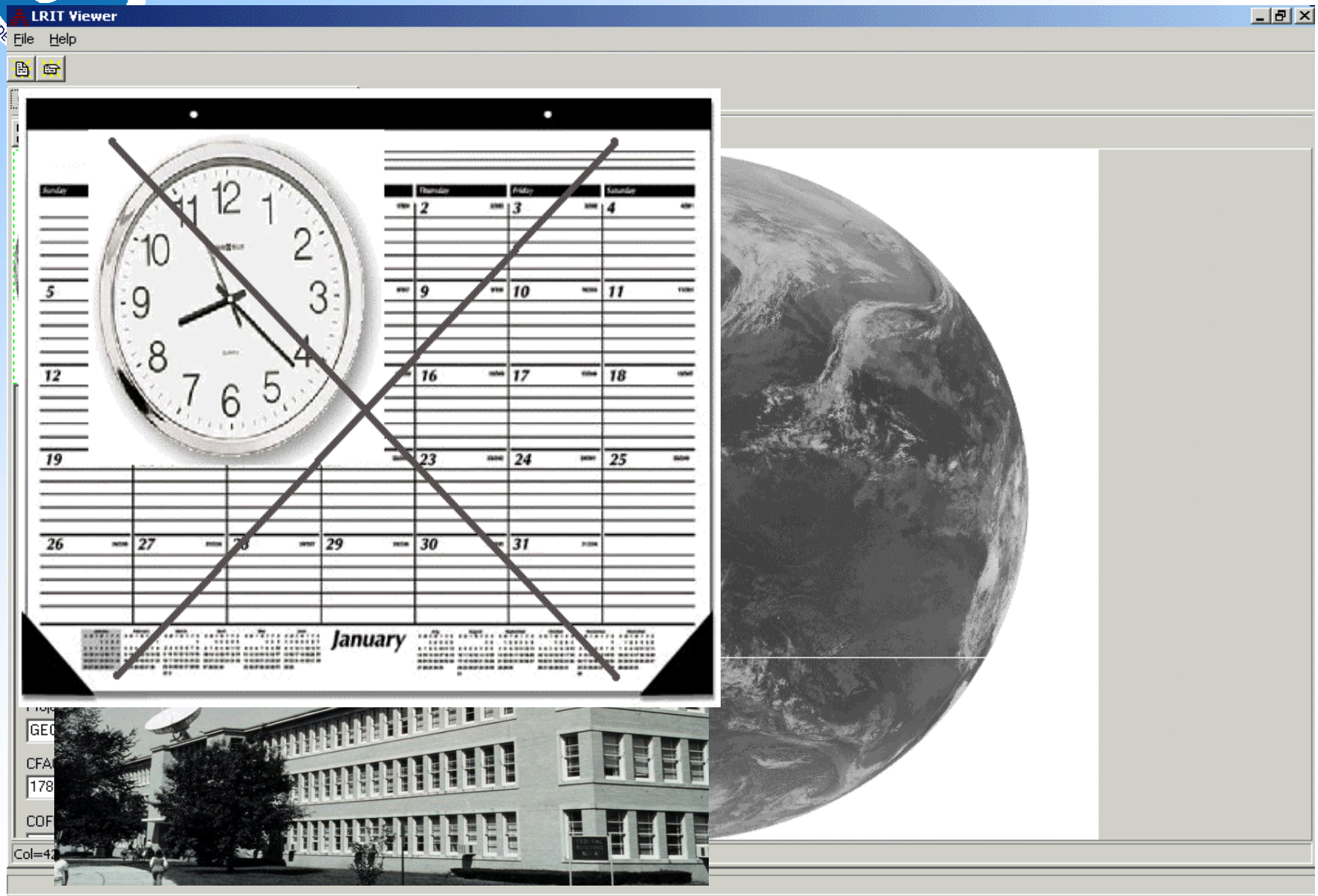
Increased product capacity, flexibility and timeliness

ADVANTAGES of LRIT

"More Data"

- Amount of LRIT Data in the current timeshare mode ~ 31.6 MB per 30 minute timeshare period
- Amount of LRIT Data possible in 24 hours -- 1.5 GB per day
- Compression allows for more data
  - File compression (JPEG, Zip)
  - Packet compression (Rice)
    - Up to 30% reduction in size

ADVANTAGES of LRIT



ADVANTAGES of LRIT

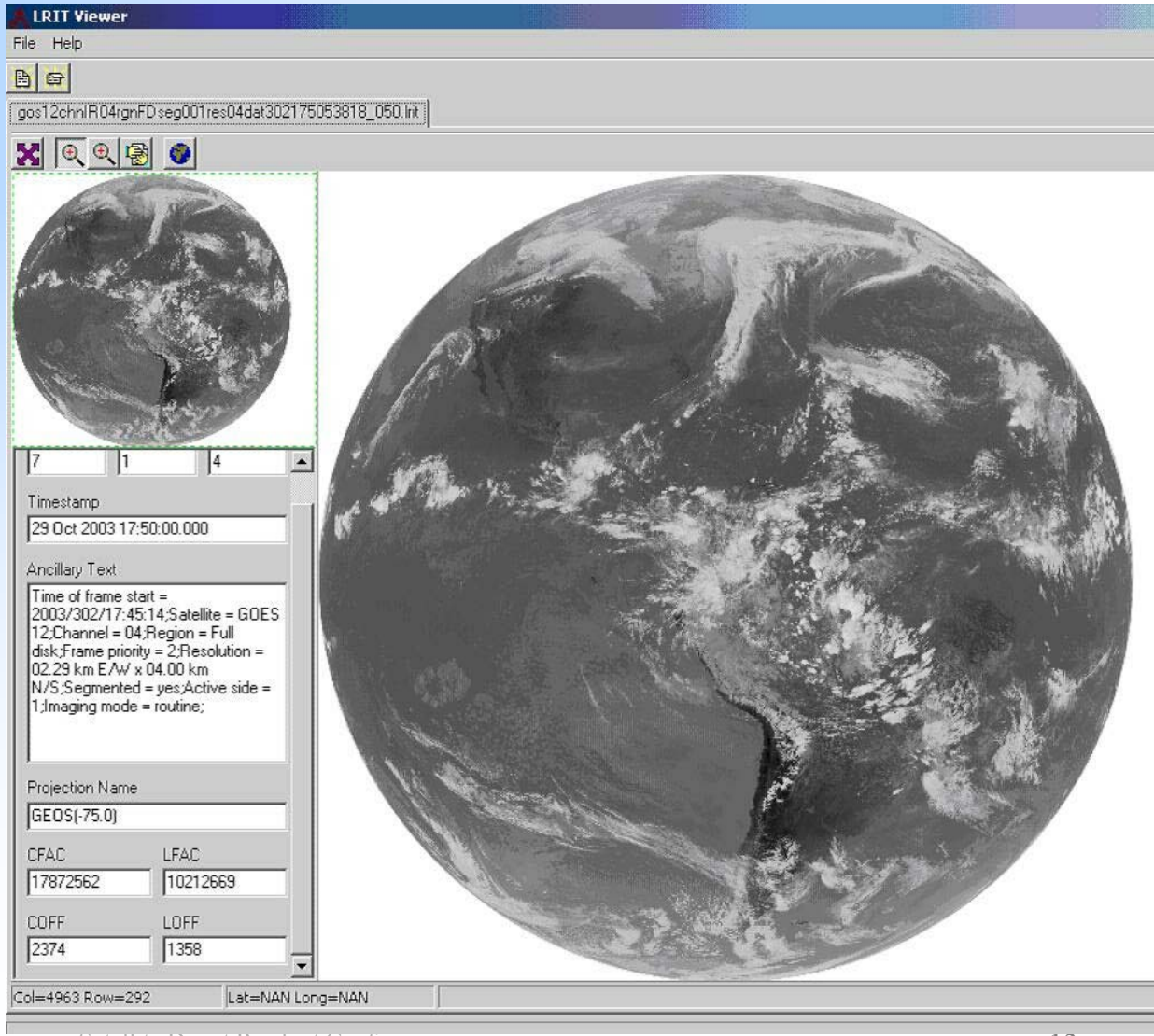
"More Diverse Product Suite"

- Used WEFAX as a baseline
- GOES primary data source
- NOAA's National Weather Service to provide:
  - Various charts
  - Selected EMWIN messages
- GMS (currently GOES-9)
- GOES Data Collection Service
- Evolving Capabilities and Products

ADVANTAGES of LRIT

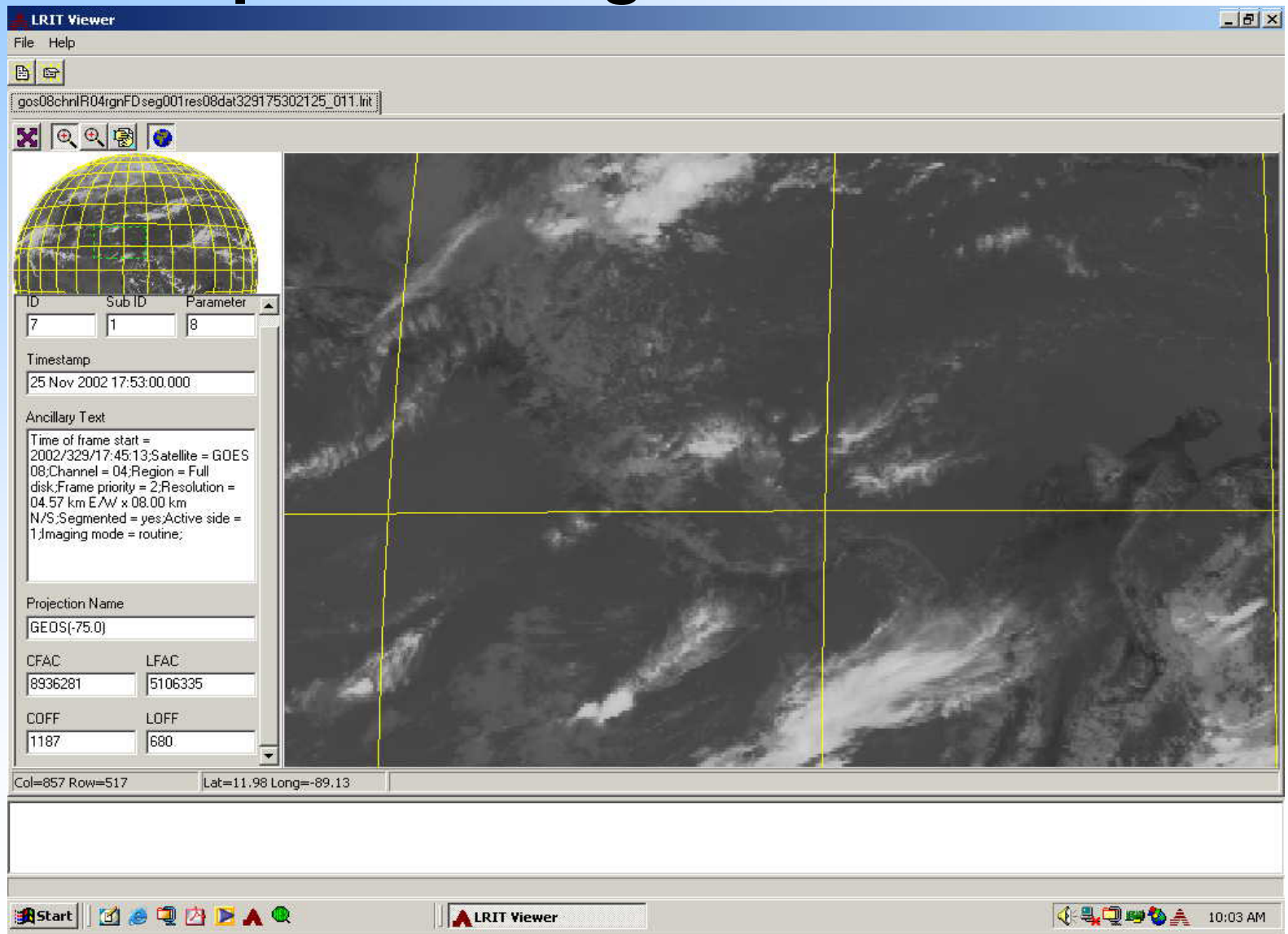
"Improved Image Resolution"

- Higher resolution GOES products to the users
  - 16 km full disk standard with WEFAX
  - 4 km full disk standard with LRIT

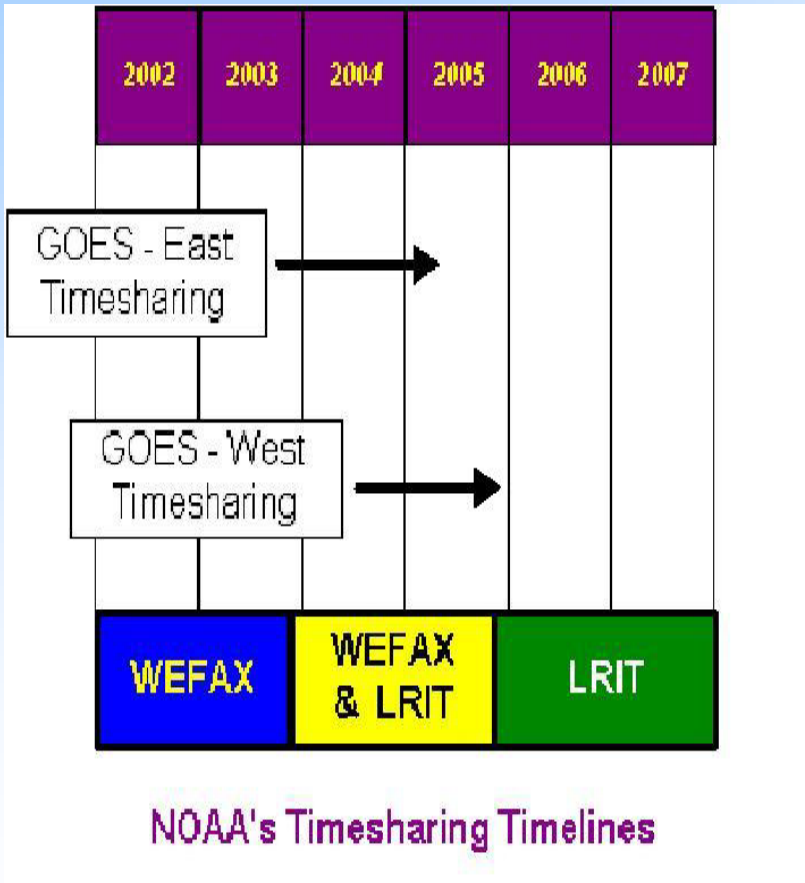


ADVANTAGES of LRIT

"Improved Image Resolution"



LRIT Transition Plans



NOAA's Timesharing Timelines

- GOES – East timesharing continues until March 2005
- GOES-West timesharing began Fall 2004
- Full Time, all LRIT, by the end of 2005

Summary

- LRIT is an Integrated Stream of Diverse Digital Products that can be Transmitted Asynchronously and has Reduced Latency, Improved User Flexibility, Increased Product Resolution, and Increased Reliability compared to WEFAX
- Consideration of LRIT users and value added providers including efficient transition through service overlaps
- **The Transition to Operations of NOAA's LRIT System Is Underway**

LRIT Links

Email: LRIT@NOAA.GOV

For everything you wanted to know about LRIT at NOAA:
http://noaasis.noaa.gov/LRIT/

Operational info: http://www.osdpd.noaa.gov/COB/COB.html

ADDITIONAL SLIDES

Comparison of Services

WEFAX

(Weather Facsimile)

Transmits only images using low rate analog facsimile, 24 hours a day on a fixed schedule of 4 and 5 minute time slots.

LRIT

(Low Rate Information Transmission)

Integrated stream of diverse products that can be transmitted asynchronously on an as-available basis.

LRIT User Terminal General Requirements

- CGMS Compatibility (CCSDS)
- Reliable RF Performance
- Low Cost

LRIT User Terminal Low Cost Considerations

- WEFAX RF compatibility
- NOAA provided software
  - Basic receive processing
  - Basic data management
  - Basic viewing
- Value added capability

LRIT User Terminal Basic Components

Receiver

- **1 meter dish**
- **Low noise amplifier**
- **Down converter**
- **Demodulator**

Workstation

- **PC**
- **Software**
  - **CCSDS LRIT processing**
  - **File handling**
  - **Viewing**

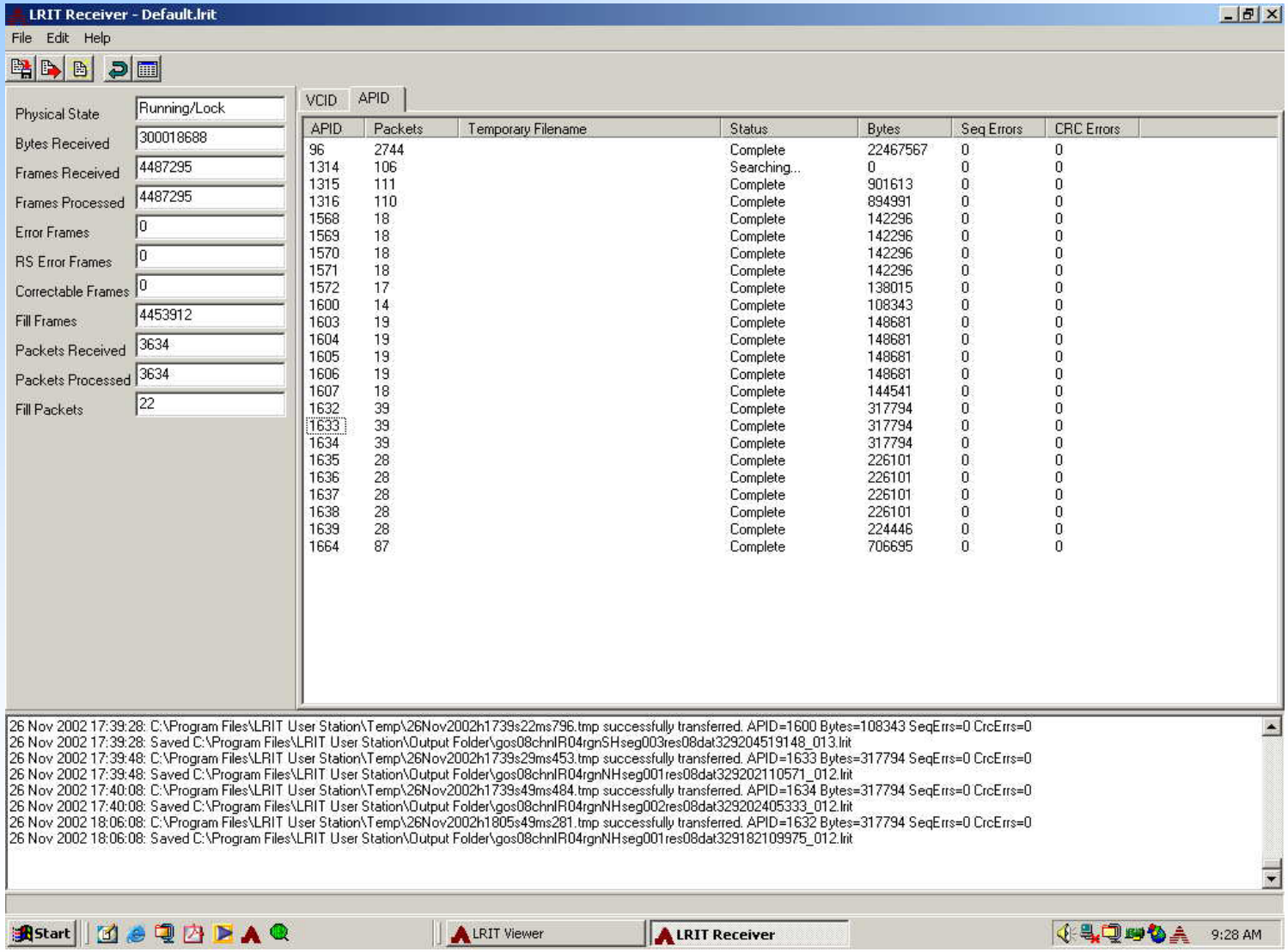
GOES Data Collection System (DCS)

- GOES DCS data inserted into the LRIT data stream will originate at Wallops
- Data Priority: High, Medium, Low
- Data Format: (concatenated files)
- Receiver Application: ??
- Data Compression: None currently, Zip in testing

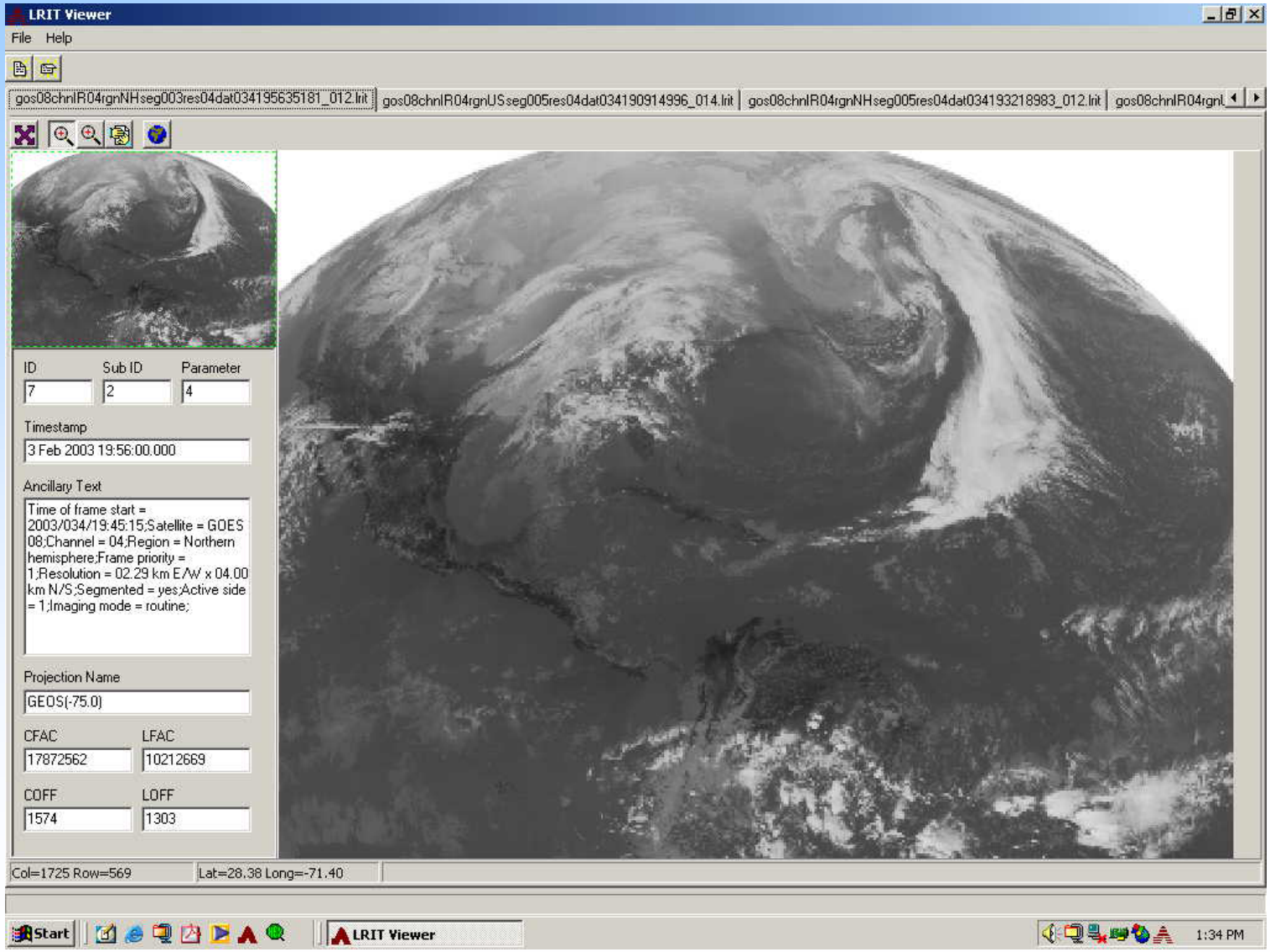
Sample DCS data file

```
pH-03346145527-A.dcs
□□CE32A1AE03346145508G36-
5NN031E9200197B1J@E`@UpACz@E{@EK@UpACz@Ez
@EE@UpACz@Ez@EB@UpACz@Ey@EQ@UoACz@Ey@D|@U
oACz@Ex@EE@UpACz@Ey@EL@UpACz@Ex@D{@UoACz@
Ex@EE@UoACz@Ex@Dz@UoACz@Ex@Dv@UoACz@Ex@EF
@UmACz@Ew@Dz@UmACz@Ev@D|@UmACz@Ev@D}@UmAC
z@EvJ @Oês
```

LRIT User Terminal Receiver Screen Shot



LRIT User Terminal Viewer Screen Shot



LRIT User Terminal Viewer Screen Shot